CBSE Class 10 Maths Chapter 3 – Pair of Linear Equations in Two Variable

Objective Questions

Algebraic Solution

1. Half the perimeter of a rectangular room is 46 m, and its length is 6 m more than its breadth. What is the length and breadth of the room?

(A) 2m, 20m

(B) 2m, 3m

(C) 56m, 40m

(D) 26m, 20m

Answer: (D) 26m, 20m

Solution: Let l and b be the length and breadth of the room. Then, the perimeter of the room = 2(l+b) metres
From question, l=6+b... (1)

$$\frac{1}{2}\times 2(l+b) = 46 \Longrightarrow l+b=46... (2)$$

Using Substitution method:
Substituting the value of l from (1) in (2), we get
6+b+b=46
⇒ 6+2b=46⟹2b=40
⟹b=20 m.
Thus, l=26 m

2. Solve the following pair of equations:
2x+y=7
3x+2y=12
Choose the correct answer from the given options.

(A) (-3,2)

(B) (1,0)

(C) (3,2)

(D) (2,3)

Answer: (D) (2, 3)

Solution: We have,

$2x+y=7$ ... (1)
$3x+2y=12$... (2)

Multiply equation (1) by 2, we get:

$2(2x+y)=2(7)$
$\Rightarrow 4x+2y=14$... (3)

Subtracting (2) from (3) we get,

$x=2$
Substituting the value of x in (1) we get,
$2(2)+y=7 \Longrightarrow y=3$

Thus, the solution for the given pair of linear equations is (2, 3).

3. Solve

$\frac{3x}{2} - \frac{5y}{3} = -2; \frac{x}{2} + \frac{y}{2} = \frac{13}{6}$

(A) Y= $\frac{51}{19}$

(B) X= = $\frac{51}{19}$

(C) Y=$\frac{94}{57}$

(D) X= $\frac{117}{54}$

Answer: (A) Y= $\frac{51}{19}$

Solution: $\frac{3x}{2} - \frac{5y}{3} = -2$

LCM of 2 and 3 is 6. Multiply by 6 on both sides

$9x-10y=-12$ ------------- (1)

$\frac{x}{2}+\frac{y}{2}=\frac{13}{6}$

LCM is 6. Multiply by 6 on both sides

$3x+3y=13$ --------------(2)

Multiply equation (2) by 3 to eliminate x; so we get,

$9x+9y=39$..............(3)

Subtract (3) from (1) we have

$-19y=-51 \Rightarrow y=\frac{51}{19}$

Substitute this in one of the equation and we get

$X= 10[\frac{\frac{51}{19}-2}{9}]=\frac{282}{19X9}=\frac{94}{3X19}=\frac{94}{57}$

$\Rightarrow x = \frac{94}{57}$

4. Given: $3x–5y=4;9x=2y+7$

Solve above equations by Elimination method and find the value of x.

(A) $X=\frac{9}{13}$

(B) $Y=\frac{5}{13}$

(C) X= $\frac{-5}{13}$

(D) Y= $\frac{9}{13}$

Answer: X= $\frac{9}{13}$

Solution: Given:

3x–5y=4......(1)

9x=2y+7

9x−2y=7.....(2)

Multiply equation (1) by 3

⇒9x–15y=12.......(3)

Subtracting (2) from (3) we get,

−13y=5

Y= -$\frac{-5}{13}$

Substituting the value of y in (2)

9x=2y+7

X= $\frac{7+2y}{9}$

X= $\frac{7-\frac{10}{13}}{9} = \frac{81}{13\times9}$

X= $\frac{9}{13}$

All about Lines

5. Choose the pair of equations which satisfy the point (1,-1)

   (A) $4x–y=3, 4x+y=3$
   (B) $4x+y=3, 3x+2y=1$
   (C) $2x+3y=5, 2x+3y=−1$
   (D) $2x+y=3, 2x–y=1$]

Answer: (B) $4x+y=3$, $3x+2y=1$

Solution: For a pair of equations to satisfy a point, the point should be the unique solution of them.
Solve the pair equations $4x+y=3, 3x+2y=1$
let $4x+y=3$.....(1)
and $3x+2y=1$ .....(2)
$y=3−4x$ [From (1)]
Substituting value if y in (2)
$3x+2y=1$
$3x+2(3−4x)=1$
$3x+6−8x=1$
$−5x=−5 \Rightarrow x=1$
Substituting x = 1 in (1),
$4(1)+y=3 \Rightarrow y=−1$
⇒ (1,-1) is the solution of pair of equation.
∴ Pair of equations which satisfy the point (1,-1)
Note: - We can also substitute the value (1,-1) in the given equations and check if it satisfies the pair of equations or not. In this case it only satisfies the pair of equation $4x+y=3$, $3x+2y=1$ and hence (1, -1) is the unique solution of the equation.

6. 54 is divided into two parts such that sum of 10 times the first part and 22 times the second part is 780. What is the bigger part?

   (A) 34
   (B) 32
   (C) 30
   (D) 24

   Answer: (A) 34

   Solution: Let the 2 parts of 54 be x and y

   $x+y = 54$.... (i)

   and $10x + 22y = 780$ -------------------- (ii)

Multiply (i) by 10, we get

10 x + 10 y = 540----------------------- (iii)

10x + 22y = 780 -------------- (ii) {Subtracting (ii) from (iii)}

(-) (-) (-)

____

- 12y = - 240

y = 20

Substituting y = 20 in x + y = 54, we have x + 20 = 54; x = 34

Hence, x = 34 and y = 20.

7. What are the values of **a**, **b** and **c** for the equation y=0.5x+$\sqrt{7}$ when written in the standard form: ax+by+c=0?

(A) 0.5, 1, $\sqrt{7}$

(B) 0.5, 1, -$\sqrt{7}$

(C) 0.5, -1, $\sqrt{7}$

(D) -0.5, 1, $\sqrt{7}$

Answer: (C) 0.5, -1, $\sqrt{7}$

Solution: Y= 0.5X + $\sqrt{7}$

⇒0.5x−y+ $\sqrt{7}$= 0

The general form of an equation is ax+by+c=0.
Here, on comparing, we get
a=0.5, b=−1 and c=$\sqrt{7}$

8. Which of the following pair of linear equations has infinite solutions?

(A) $\frac{1}{2}$X + 2Y = $\frac{7}{11}$; X+6Y =21

(B) y+2x=10; 11x+6y=21

(C) 4x+3y=7; 3x+6y=25

(D) x+2y=7; 3x+6y=21

Answer: (D) x+2y=7; 3x+6y=21

Solution: If two equations are consistent and overlapping, then they will have infinite solutions. Option A consists of two equations where the second equation can be reduced to an equation which is same as the first equation.
x+2y=7.... (i)
3x+6y=21..... (ii)
Dividing equation (ii) by 3, we get
x+2y=7 which is the same as equation (i).
The equations coincide and will have an infinite solution.

Alternate Method:
Let the two equations be

a_1x+ b_1y+c_1=0

a_2x+ b_2y+c_2=0

The condition for having infinite solutions is:
$\frac{a_1}{a_2}$= $\frac{b_1}{b_2}$= $\frac{c_1}{c_2}$.... (I)

For the equations, on substituting values in eq (i), we get
$\frac{1}{3}$= $\frac{2}{6}$=$\frac{-7}{-21}$

∴ The pair of equations x+2y=7 and 3x+6y=21. Have infinite solutions.
Similarly, we can check that other options don't have infinite solutions.

Basics Revisited

9. Which of these points lie on the line $7x+8y=61$

(A) (3,4)
(B) (2,5)
(C) (-3,7)
(D) (3,5)

Answer: (D) (3, 5)

Solution: Substituting the value of $x = 3$ and $y = 4$,
$7x+8y=61 = 7(3) +8(4) =53$.

Substituting the value of $x = 2$ and $y = 5$,
$7x+8y=61 = 7(2) +8(5) =54$.

Substituting the value of $x = -3$ and $y = 7$,
$7x+8y=61 = 7(-3) +8(7) =35$.

Substituting the value of $x = 3$ and $y = 5$,
$7x+8y=61 = 7(3) +8(5) =61$

Hence, (3, 5) lies on the given line

10. Which of these following equations have $x=-3$, $y=2$ as solutions?

(A) $3x-2y=0$
(B) $3x+2y=0$
(C) $2x+3y=0$
(D) $2x-3y=0$

Answer: (C) $2x+3y=0$

Solution: Substituting the values in LHS,

L.H.S$=2x+3y$

L.H.S$=2(-3) +3(2)$

L.H.S$=0=$R.H.S

Hence $x=-3$, $y=2$ is the solution of the equation $2x+3y=0$

11. If y = $\frac{1}{2}$ (3x+7) is rewritten in the form ax+by+c=0, what are the values of a, b and c?

(A) $\frac{1}{2}, \frac{7}{2}, \frac{3}{2}$

(B) 7,2,3

(C) -2, 3, -7

(D) -3,2,-7

Answer: (D) -3, 2,-7

Solution: The given equation is:

$y = \frac{1}{2}(3x+7)$

Simplifying the equation we get:

$2y-3x-7=0$

$\Rightarrow -3x+2y-7=0$ (1)

Thus, the value of a, b and c is -3, 2 and -7 respectively.

The equation can also be written as,

$3x-2y+7=0$

Thus, the value of a, b and c is +3, -2 and +7 respectively.

The option -3, 2 and -7 is correct [Since +3, -2 and +7 is not an option]

12. x−y=0 is a line:

(A) Passing through origin

(B) Passing through (1,-1)

(C) || to y axis

(D) || to x axis

Answer: (A) Passing through origin

Solution: x−y=0, is a line passing through the origin as point (0, 0) satisfies the given equation

Graphical Solution

13. If $\frac{a_1}{a_2}=\frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ in the system of equations a_1x+ b_1y+c_1=0 and a_2x+ b_2y+c_2=0

Statement 1: This is the condition for inconsistent equations

Statement 2: There exists infinitely many solutions

Statement 3: The equations satisfying the condition are parallel

Which of the above statements are true?

(A) s_1 only

(B) s_1 and s_2

(C) s_1 and s_3

(D) s_2 only

Answer: (C) s_1 and s_3

Solution: If $\frac{a_1}{a_2}=\frac{b_1}{b_2} \neq \frac{c_1}{c_2}$,

The condition is for inconsistent pair of equations which are parallel and have no solution.

∴ Statement 1 and 3 are correct

14. $\frac{x}{5}+\frac{y}{3}=1$ and $\frac{x}{k}+\frac{y}{m}=1$. Choose the correct statement.

(A) For k≠3 $\frac{m}{5}$ a unique solution exists

(B) For k=3 $\frac{m}{5}$, infinitely many solutions exists

(C) For k= 5 $\frac{m}{3}$, a unique solution exists

(D) For k= 5 $\frac{m}{3}$, infinitely many solutions exist

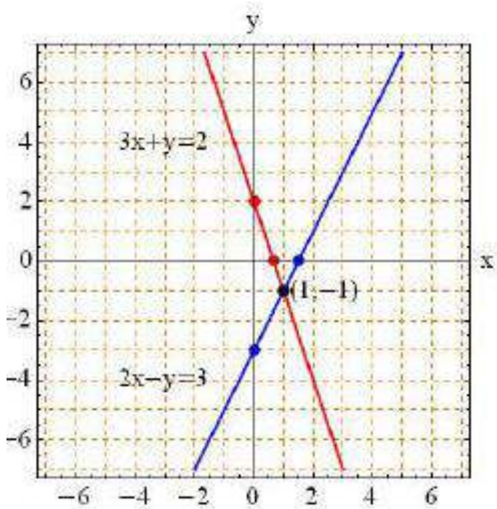
Answer: For k= 5 $\frac{m}{3}$, infinitely many solutions exist

Solution: $\frac{a_1}{a_2}=\frac{k}{5}$ $\qquad$ $\frac{b_1}{b_2}=\frac{m}{3}$

For, unique solution, $\frac{k}{5} \neq \frac{m}{3}$ $\Rightarrow k \neq 5\frac{m}{3}$

For, infinitely many solutions $\frac{k}{5} = \frac{m}{3}$ $\Rightarrow k = 5\frac{m}{3}$

15. The figure shows the graphical representation of a pair of linear equations. On the basis of graph**,** the pair of linear equation gives ________________solutions.



(A) Four

(B) Only one

(C) Infinite

(D) Zero

Answer: (B) Only one

Solution: If the graph of linear equations represented by the lines intersects at a point, this point gives the unique solution. Here the lines meet at the point (1,-1) which is the unique solution of the given pair of linear equations.

16. For what value of *k*, the pair of linear equations 3x+ky =9 and 6x+4y=18 has infinitely many solutions?

(A) -5

(B) 6

(C) 1

(D) 2

Answer: Given equations gives infinitely many solutions if,

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

The given linear equations are:
3x+ky=9; 6x+4y=18.

$\Rightarrow a_1 = 3, b_1 = k, c_1 = -9$ and $a_2 = 6$, $b_2 = 4$, $c_2 = -18$

$$\Rightarrow \frac{3}{6} = \frac{k}{4} = \frac{-9}{-18}$$

$$\Rightarrow \frac{1}{2} = \frac{k}{4}$$

$\Rightarrow k = 2$

Solving Linear Equations

17. Solve the following pair of linear equation

$\frac{2}{\sqrt{x}}+\frac{3}{\sqrt{y}}=2$

$\frac{4}{\sqrt{x}}-\frac{9}{\sqrt{y}}=-1$

(A) 9,8

(B) 4,9

(C) 3,2

(D) $\frac{1}{2},\frac{1}{3}$

Answer: (B) 4, 9

Solution: The pair of equations is not linear. We will substitute $\frac{1}{x}$ as u^2 and $\frac{1}{y}$ as v^2 then we will get the equation as

2u+3v=2

4u−9v=−1

We will use method of elimination to solve the equation.
Multiply the first equation by 3, we get

6u+9v=6

4u−9v=−1

Adding the above two equations

10u=5

u= $\frac{1}{2}$

Substituting u in equation 4u−9v=−1 we get v= $\frac{1}{3}$

So x= $\frac{1}{u^2}$=4

y= $\frac{1}{v^2}$ = 9

18. Solve the following pair of equation

$\frac{7x-2y}{xy} = 5$

$\frac{8x+6y}{xy}$ =15

(A) None of these

(B) 2, not defined

(C) $\frac{5}{2}$, not defined

(D) $\frac{-2}{5}$, not defined

Answer: (D)$\frac{-2}{5}$, not defined

Solution: First separate the variables

$\frac{7x-2y}{xy} = 5$

$\frac{7x}{xy}$-$\frac{2y}{xy}$**= 5**

$\frac{7}{y}$-$\frac{2}{x}$ **=5**

Similarly we can do separation of variables for second equation

$\frac{8x+6y}{xy}$ =15

$\frac{8}{y}$ - $\frac{6}{x}$= 15

Now we see that the equation is not linear.

So we will substitute $\frac{1}{x}$= u and $\frac{1}{y}$= v

The pair of equation can be written as

-2u+7v=5

-6u+8v=15

We can solve the pair of equation by method of elimination.

-6u+21v=15---------------------------- (1)

-6u+8v = 15---------------------------- (2)

Subtracting (2) from (1), we get 13v = 0; v = 0

Substituting v = 0 in -2u + 7v = 5
we get u= -$\frac{5}{2}$

$\frac{1}{x}$= u and $\frac{1}{y}$ = v

∴x = − $\frac{2}{5}$ and y = not defined

19. Find x and y if $\frac{5}{2+x}$ + $\frac{1}{y-4}$= 2

$$\frac{6}{2+x} + \frac{3}{y-4} = 1$$

(A) x = -2, y = 2

(B) x = 7, y = -8

(C) x = 0, y = 8

(D) x = 1, y = 7

Answer: (D) x = 1, y = 7

Solution: Let, p= $\frac{1}{2+x}$ and q= $\frac{1}{y-4}$

Thus, 5p + q = 2---- (i)
6p - 3q = 1----- (ii)

Multiply (i) by 3

⇒ 15p + 3q = 6---- (iii)

Adding (iii) and (ii),

21p = 7

p= $\frac{1}{3}$

Substitute the value of p in (i)

$5 \times \frac{1}{3}$ + q=2

q= 2- $\frac{5}{3}$

⇒ q = $\frac{1}{3}$

Now, p = $\frac{1}{2+x}$

$\Rightarrow \frac{1}{3} = \frac{1}{2+x}$

$\Rightarrow$ x = 1

q = $\frac{1}{y-4}$

$\Rightarrow \frac{1}{3} = \frac{1}{y-4}$

$\Rightarrow$ y = 7

20. Solve the following pair of equations:

$\frac{1}{x} + \frac{3}{y} = 1$

$\frac{6}{x} - \frac{12}{y} = 2$

$(\text{where } x \neq 0, y \neq 0)$

(A) X=$\frac{5}{3}$, Y=$\frac{15}{2}$

(B) x=4,y=9

(C) x=3,y=11

(D) X=$\frac{3}{5}$, Y=$\frac{7}{3}$

Answer: (A) X=$\frac{5}{3}$, Y=$\frac{15}{2}$

Solution: Let $\frac{1}{x} = \text{a and } \frac{1}{y}$ = b

(As x≠0, y≠0)

Then, the given equations become

a+3b=1 … (1)

6a−12b=2 … (2)

Multiplying equation (1) by 4, we get 4a+12b=4 … (3)

On adding equation (2) and equation (3), we get 10a=6

⇒a= $\frac{3}{5}$

Putting a= $\frac{3}{5}$ in equation (1), we get

$\frac{3}{5}$ +3b=1

⇒b= $\frac{1-(\frac{3}{5})}{3}$

⇒b= $\frac{2}{15}$

Hence, x= $\frac{5}{3}$ and y= $\frac{15}{2}$